

63.9
Australia
1918-1919

12123

LIBRARY
RECEIVED
★ JUN 7 1921 ★
U.S. Department of Agriculture

SWEET CLOVER

— AND ITS —

UTILITY



Price, 1/- per Copy

F. H. BRUNNING PTY. LTD.
64 ELIZABETH STREET, MELBOURNE

Australia

SWEET or BOKHARA CLOVER

(*Melilotus alba* or *leucantha*)

Machine-dressed, New Crop, Scarified Seed

Use only Brunning's Special Quality

For Pasture, Hay, Ensilage or Soil Improving

KING ISLAND MELILOT

(*Melilotus indica* or *parviflora*)

New Crop, Clean Seed of Strong Growth

NOTE.—The seed of King Island Melilot should be soaked for 24 hours before sowing.

Invaluable as an Orchard Cover Crop

YELLOW SWEET CLOVER

(*Melilotus officinalis* or *arvensis*)

Beekeepers should always plant some Yellow Sweet Clover in conjunction with Sweet or Bokhara Clover for Honey purposes.

Splendid for Green Manuring.

Samples and prices of the above Post Free
on application to

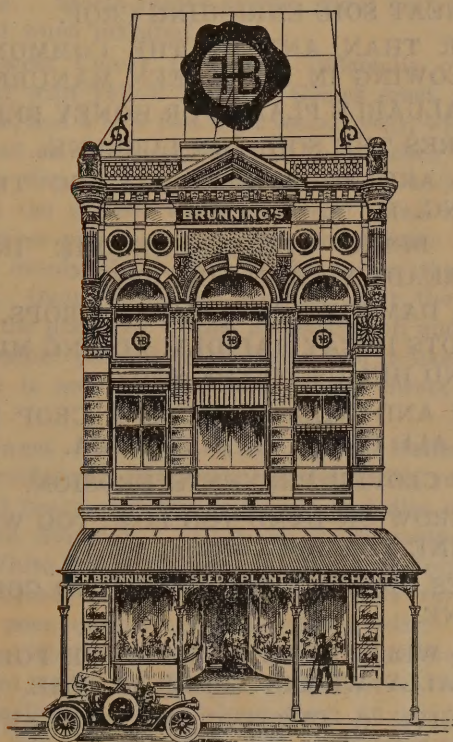
BRUNNINGS

(F. H. BRUNNING PTY. LTD.)

64 ELIZABETH ST., MELBOURNE (P.O. Box 857)

SWEET CLOVER AND ITS UTILITY

BY
LESLIE H. BRUNNING



F. H. BRUNNING PTY. LTD.
64 ELIZABETH STREET, MELB.

SWEET CLOVER

ADVANTAGES OF SWEET OR BOKHARA CLOVER (*Melilotus alba*).

Consider the following facts regarding Sweet Clover. Will any other plant do as much, or can any other plant show such hardiness and adaptability ?

1. IT IS NOT A WEED.
2. LIKE LUCERNE, IT IS RICH IN PROTEIN.
3. WILL NOT BLOAT CATTLE OR SHEEP.
4. EQUAL TO LUCERNE FOR PASTURE.
5. IT IS A GREAT MILK PRODUCER.
6. FURNISHES EARLY SPRING PASTURE.
7. CONTAINS MORE PROTEIN THAN RED CLOVER.
8. FITS WELL IN THE CROP ROTATION.
9. IS A GREAT SOIL ENRICHING CROP.
10. BETTER THAN ANY OF THE COMMON CLOVERS FOR PLOWING IN FOR GREEN MANURE.
11. IS A VALUABLE PLANT FOR HONEY BEES.
12. PREPARES THE SOIL FOR LUCERNE.
13. ROOTS ARE SOFT AND GIVE NO TROUBLE IN PLOWING.
14. ROOTS BEING TENDER BECOME INOCULATED MORE READILY THAN LUCERNE.
15. NEVER DAMAGES CULTIVATED CROPS.
16. ITS ROOTS DECAY RAPIDLY, ADDING MUCH NITROGEN AND HUMUS TO THE SOIL.
17. GROWS AND WILL PRODUCE A CROP IN PRACTICALLY ALL PARTS OF AUSTRALIA.
18. SWEET CLOVER PREVENTS EROSION.
19. WILL GROW ON LAND TOO LOW, TOO WET, OR TOO ALKALINE FOR LUCERNE.
20. THRIVES ON LAND TOO HARD AND COMPACT FOR LUCERNE.
21. GROWS WELL ON LAND TOO POOR FOR LUCERNE, ESPECIALLY WHERE THERE IS LIME.
22. WILL GIVE A CUTTING OF HAY AND A SEED CROP IN THE ONE SEASON.
23. WITHSTANDS FROSTS AND EXTREME COLD AS WELL AS HOT DRY WEATHER AND DROUGHT.

Use Lime Freely and Sweet Clover will well repay your outlay.

AND ITS UTILITY

SWEET CLOVER AND ITS UTILITY

THE MELILOTUS FAMILY.

In order to remove any possible misunderstanding, the term "Sweet Clover" as used in this booklet is applied throughout to the Biennial White Sweet or Bokhara Clover (*Melilotus Alba* or *Leucantha*). This plant belongs to the *Melilotus* family of which there are a number of species, the principal of which are :—

White Sweet or Bokhara Clover (*Melilotus Alba* or *Leucantha*). Biennial plant with white flowers. Grows erect, 3 to 4 feet high the first year, and 6 to 11 feet high second year, when it blooms and bears seed on slender racemes 3 to 12 inches long. Stems rather coarse, about half an inch thick at the ground when matured.

Yellow Sweet Clover (*Melilotus Officinalis* or *Arvensis*). Biennial plant with yellow flowers. Grows erect, 2½ to 3 feet high first year, and 4 to 5 feet high second year, when it blooms and bears seed on slender racemes 3 to 6 inches long. Stems are nearly as fine as Lucerne, seldom being a quarter of an inch thick at the ground when matured. Has a larger proportion of leaves and finer branches, and blooms and matures its seed crop evenly about three weeks earlier than the White Sweet Clover. Owing to its low-growing habit, the mower very often misses the plants of Yellow Sweet Clover, and this variety is therefore rather difficult to eradicate, and is likely to become a pest which is not the case with White Sweet or Bokhara Clover.

Indian Sweet Clover or King Island Melilot (*Melilotus Indica* or *Parviflora*). An annual variety with yellow flowers. It blooms and bears seed the first year, and dies out about the middle of the Summer. Contains more cumarin than the Yellow and White Sweet Clovers, and has been termed Hexham Scent, Sour Clover and Stink Clover. This variety is only valuable on poor quality ground, where better class fodder plants will not thrive, and unless grown near the sea-coast is liable to taint milk and butter. *Melilotus Parviflora* has, however, transformed King Island from an island of useless sand dunes into one of the best grazing districts of the Commonwealth. This wonderful grass, in the course of a few years completely changed the character of the soil and in-

**Remember ! Sweet Clover is not a weed, but a valuable
Fodder Plant.**

creased its value 100 per cent. The present export trade of King Island of fat cattle, dairy produce, honey, etc., is the best testimony as to what King Island Melilot has done there. This is not the best grass there is, and as mentioned above, it should only be planted on poor quality ground where better class fodder plants will not thrive, but for poor sandy country lying idle, King Island Melilot is the plant. For instance, there are paddocks of Lucerne growing on King Island which would not be there now if this Melilotus had not improved the soil sufficiently to allow it to do well.

The Melilotus family possesses a strong, distinct, sweetish fragrance of the flower, and also of the plant, especially when drying. This is due to an ethereal oil it possesses known as cumarin.

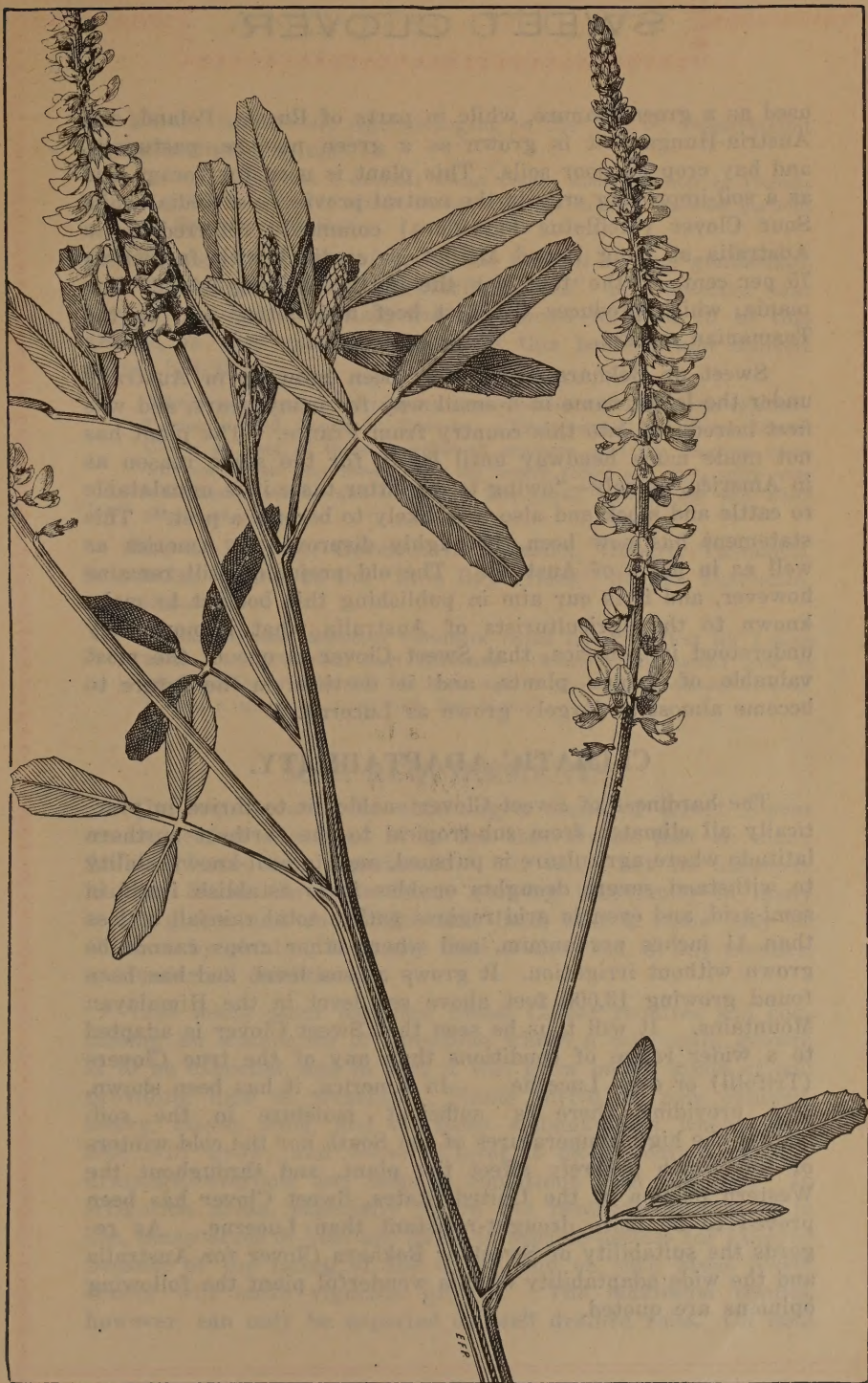
HISTORY AND DISTRIBUTION OF SWEET CLOVER

Sweet or Bokhara Clover is one of the oldest of known plants, and its history runs back into the dimness and obscurity of the earliest times. This plant and Lucerne originated in North West India and in Central or Western Asia, and were known at an early period in Persia, Greece, Egypt, Rome and other places in the Mediterranean region. For centuries, Sweet or Bokhara Clover has been growing throughout Europe, and thence it seems to have been introduced throughout America.

The name "Bokhara Clover" has been derived from the fact that this plant is supposed to have originated in the first place in Bokhara in Central Asia. This country consists principally of desert and mountain ranges, devoted largely to the raising of goats, sheep, and cattle, and possesses a climate of unusual severity, being extremely cold in Winter and very hot, with droughty conditions in Summer. Except in Bokhara, the early accounts of Sweet Clover do not seem to have distinguished between the various species, and all varieties were originally known under this name. It was not until the plant reached Europe that separate mention was made of the biennial yellow kind.

The plant is grown to a limited extent in England, while in the eastern part of Scotland a small quantity is considered valuable in hay on account of its agreeable odor. The famous Gruyere cheese of Switzerland owes its flavor to yellow sweet clover. In Central Europe it has given very good results when

The Feeding Value of Sweet Clover is equal to that of Lucerne.



MELILOTUS ALBA. WHITE SWEET OR BOKHARA CLOVER.

SWEET CLOVER

used as a green manure, while in parts of Russia, Poland, and Austria-Hungary it is grown as a green manure, pasturage, and hay crop on poor soils. This plant is used for forage and as a soil-improving crop in the central provinces of India, while Sour Clover (*Melilotus Parviflora*) commonly referred to in Australia as King Island Melilot, is credited with furnishing 75 per cent. of the feed for the cattle of King Island, Tasmania, which produces the best beef and butter sold on the Tasmanian market.

Sweet or Bokhara Clover has been growing in Australia under the latter name in a small way for many years, and was first introduced into this country from France. The plant has not made much headway until lately for the same reason as in America, namely—"owing to its bitter taste it is unpalatable to cattle and stock and also it is likely to become a pest." This statement has now been thoroughly disproved in America as well as in parts of Australia. The old prejudice still remains however, and it is our aim in publishing this booklet to make known to the agriculturists of Australia what is now fully understood in America, that Sweet Clover is one of the most valuable of forage plants, and is destined in the future to become almost as largely grown as Lucerne.

CLIMATIC ADAPTABILITY.

The hardiness of Sweet Clover enables it to thrive in practically all climates from sub-tropical to the farthest northern latitude where agriculture is pursued, and its well-known ability to withstand severe droughts enables it to establish itself in semi-arid, and even in arid regions with a total rainfall of less than 11 inches per annum, and where other crops cannot be grown without irrigation. It grows at sea level, and has been found growing 13,000 feet above sea level in the Himalayan Mountains. It will thus be seen that Sweet Clover is adapted to a wider range of conditions than any of the true Clovers (*Trifolii*) or even Lucerne. In America, it has been shown, that providing there is sufficient moisture in the soil, neither the high temperatures of the South nor the cold winters of the North severely affect the plant, and throughout the Western portion of the United States, Sweet Clover has been proved to be more drought-resistant than Lucerne. As regards the suitability of Sweet or Bokhara Clover for Australia and the wide adaptability of this wonderful plant the following opinions are quoted.

Sweet Clover will grow well in most parts of Australia.

AND ITS UTILITY

Mr. E. Breakwell, Agrostologist to the N.S.W. Department of Agriculture, states:—

"I might add that I consider Sweet Clover would do well in Victoria and Tasmania, as it grows remarkably well in very elevated portions of New South Wales."

and on page 23 a copy of an article written by this gentleman, and published in the "Tenterfield Star" in December last appears. Mr. Somerlad, the gentleman referred to in this article, is also quoted throughout this booklet, and himself writes 5/6/18.—

"There is no reason why Sweet Clover would not do both in Northern Tasmania and Southern Victoria. Frost won't kill young Sweet Clover so long as there is sufficient moisture, and the yearling stools will simply go into recess until the severe frosts are over, when they will emerge strong and healthy. The young growth also will stand plenty of frost."

Mr. L. Rodway, Government Botanist, Hobart, Tasmania, in a letter written to the "Emu Bay Times," Burnie, Tasmania, remarks—

"I did not meet *Melilotus Parviflora* (King Island *Melilot*) till I came here. Mr. Clennett, Port Esperance, (Southern Tasmania) used to grow *Melilotus Alba* for his bees, and it produced a wonderful crop. I have a specimen from it 9 feet high."

SOIL REQUIREMENTS.

The requirements for obtaining a stand of Sweet Clover are somewhat exacting. It is for this reason that so many failures have been experienced. It must not be assumed, because Sweet Clover is found growing luxuriantly in many waste places and on uncultivated land, that a stand may be obtained by planting it at any time of the year, in any manner, and under all conditions.

Like many other legumes, Sweet Clover requires soil containing an abundance of limestone where a maximum growth is to be expected, and in fact it will grow on all kinds of soil providing lime is present. Plants thrive on new exposed, heavy, clayey soils, and on steep embankments where little else will grow, and Sweet Clover is more tolerant of poor drainage, overflow and seepage conditions than Lucerne. In irrigation areas, especially where the reservoir system is in use, many acres of land are likely to become useless for Lucerne because of the rising of the water, and on such areas Sweet Clover will make vigorous growth. The maximum results, however, can only be expected on well drained soils. On land

Liming is essential to get the maximum results from
Sweet Clover.

not sufficiently fertile to grow Red Clover or Lucerne, Sweet Clover will do well, and it is on these soils that it will prove most valuable.

Like many other plants it makes its best growth on fertile soils rich in calcium carbonate, although it will make sufficient growth on poor soils that are not acid, to justify planting it on them. Many hilly pastures may profitably be sown with Sweet Clover, and it will not only make a valuable addition to the forage, but will improve the soil so that later on grasses will grow more abundantly. The Farmers' Bulletin, No. 797, of the United States Dept. of Agriculture, remarks that—

"Sweet Clover thrives on the adobe and granite soils of the Pacific Coast, upon the gumbo, hardpan, prairie and sandy soils of the Western North Central States, and upon the heavy clay, loam, limestone, and sandy soils of the South and East.

"In fact, it has been grown successfully on all the principal soil types in the United States, where the soils were not acid and were well inoculated. It grows luxuriantly on the Selma chalk (rotten limestone) soils of Alabama, and on soils rich in calcium carbonate in many parts of the country where the lack of nitrogen and humus has caused large numbers of farms to be abandoned.

"Some of the best pastures of the Middle West are composed of Kentucky Bluegrass, Timothy and Sweet Clover. Sweet Clover grows successfully in soils in the West which are apparently too alkaline for grains or Alfalfa (Lucerne). The Wyoming Agricultural Experiment Station reports that it has obtained good yields of Sweet Clover on seepage land which is so strongly alkaline that no other plants except some of the native grasses will survive, while the California Agricultural Experiment Station found that Sweet Clover will withstand alkali to a remarkable degree.

"Prof. F. S. Harris, agronomist of the Utah Agricultural Experiment Station at Logan, claims that it is one of the most alkali-resistant crops grown in Utah, and that in 1913 and 1914 quite an industry developed in some parts of that State in growing Sweet Clover for hay and seed on land too alkaline for other crops. Sweet Clover will generally grow on soils where salt grass (*Distichlis spicata*) will survive, and it is very much superior to this grass as pasture. After the drainage of water-logged land on which there is a surface accumulation of alkali, it is the common practice in parts of Utah to grow Sweet Clover for several years before planting Lucerne. It is often stated that alkali land will grow less tolerant crops after Sweet Clover has been grown on it for a few years. The long roots will open up the subsoil and cause better drainage, thereby affording an excellent means for removing the salts from the soil, as they are readily soluble in water. The need, therefore, of limestone will be fully realised and an application of burnt lime or finely ground limestone has made the difference between success and failure in most experiments which have been conducted on decidedly acid soils. Where Sweet Clover is sown on acid ground sufficient lime should first be applied to neutralise the acid in the soil to at least a depth of 6 inches; about 1 ton of burnt lime or 2 tons of finely ground limestone per acre is usually

Sweet Clover has remarkable adaptability as regards soil.

sufficient for this purpose. Sweet Clover has been noted to make fair growth on apparently acid soil, but such ground is usually rich in humus or phosphorous, and these cases are exceptional rather than the rule.

"A number of Sweet Clover experiments were performed on acid soils and on adjacent plats or fields of the same type of soil that had received applications of limestone varying from 1 to 4 tons to the acre. There was a marked difference in the stands obtained, and in the growth of the plants on the limed and unlimed areas. In some cases the difference in growth was so marked that the last round of the lime spreader could be distinguished at some distance from the plats. The stands were much heavier on the limed areas, and the plants made from two to three times more growth than those on the unlimed plats. Yields of hay were doubled on soils that received only sufficient limestone to neutralize the acids in the surface soil, although the yields were further increased when more limestone was added.



"The reason for the exceptional growth of Sweet Clover in north-central Kentucky is undoubtedly the fact that these soils contain an abundant supply of limestone. The Kentucky Agricultural Experiment Station states that this area is the only portion of the State where Sweet Clover is being grown with general success without applying lime."

Sweet Clover resists Drought better than Lucerne.

SWEET CLOVER

DROUGHT ENDURANCE.

Sweet Clover will resist drought better than any of the other Clovers or Lucerne, and in dry regions such as the Goulburn Valley, Bamawm and Rochester areas, the Mallee, the Irrigation Settlements in N.S.W., and the River Murray Settlements in South Australia, where the seed can be planted in the Autumn, Sweet Clover is thoroughly established by the following Spring, and will not be injured by a prolonged dry spell, after which, as soon as the Autumn rains come in, the plants make vigorous growth. One remarkable point about this plant is, while it will absorb very heavy rainfall it is able to successfully resist severe drought.

DRAINAGE.

In common with all plants of general value, Sweet Clover responds to good drainage, but its adaptability is such that it would thrive on land useless for Lucerne, Grasses, and other cultivated plants. It can be used to advantage particularly in irrigation areas, in places where the ground is likely to become quite useless for other plants owing to the surplus water, and Sweet Clover will be found to be more tolerant of poor drainage than any of the other leguminous plants.

SOIL PREPARATION.

The conditions necessary for obtaining a good stand of Sweet Clover are somewhat exacting, and for this reason many failures have been experienced in the past. It must not be assumed, however, because Sweet Clover will grow luxuriantly in many waste places and on uncultivated land, a stand may be obtained by planting any time of the year, in any manner, and under any conditions. The same care must be used in the preparation of the seed bed, the selection of the seed, and the actual sowing, if success is to be expected, as is necessary with Lucerne. Sweet Clover requires a well settled and firm seed bed with just sufficient loose soil on the surface to permit the seed be well-covered. When the seed is sown in the Spring, after a winter crop of grain, the seed bed is usually in good condition. The soil requires to be worked into a fine condition and firmed as much as possible, and it is a good practice to roll the ground with a corrugated roller after sowing. Better stands are usually obtained by seeding on fields that have been disk harrowed, than on those which have been plowed. This operation should be done several months before sowing the seed, and the ground then worked at intervals with soil

Sweet Clover requires a properly prepared seed bed.

AND ITS UTILITY

packers or harrowers. Spring tooth cultivation or disk harrowing is much preferable to plowing just previous to seeding.

Autumn plowed ground ordinarily makes an ideal seed bed for Spring sowing. A paddock that has previously been used for a crop such as Maize, Millet or Sorghum, is usually put in sufficiently good condition for Sweet Clover by disking and success has been obtained by merely broadcasting seed on sandy soil, and scratching in with a harrow.

Such a seed bed would be satisfactory if the seed could be sufficiently covered to ensure plenty of moisture, but it **must be remembered that Young Sweet Clover plants are not drought resistant**, and that every precaution should be taken in seasons of drought or on land which drought affects badly to so prepare the seed bed that the largest quantity of moisture will be conserved, and plants given an opportunity of thoroughly establishing themselves when drought will not affect them. When Sweet Clover is to be seeded in the Autumn on grain stubble, the ground should be disc harrowed and worked into good condition as soon as the grain can be removed. It is essential that the ground is always rolled after seeding.

METHOD OF LIMING THE GROUND.

If caustic lime is used, it must be slaked before being applied to the soil, or it will burn out the vegetable matter with which it comes in contact. The best method is to distribute it in heaps upon the ground, mixed with a little earth, and allow it to slake by the action of the air, before spreading it on the soil. Plow the soil a couple of months before sowing, and place the lime on it in heaps. When it has slaked, spread it with a shovel and mix it with the surface soil with disc cultivators or harrows, continuing the cultivation at intervals until time of seeding. Lime should never be plowed in, but merely worked into the surface. Finely-ground limestone rock in the form of carbonate is also suitable, and may be distributed immediately before seeding. It must be remembered that all lime has to become converted into carbonate in the soil before it will do its work.

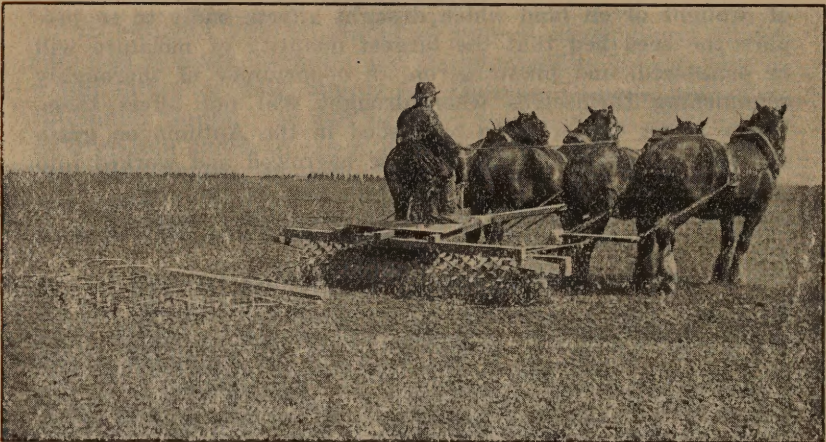
FERTILIZER REQUIREMENTS.

As Sweet Clover has been found to thrive well on barren chalk (rotten limestone hills), and on worn out abandoned land,

Liming the ground properly is justified by results.

it has been assumed it will grow on soil too depleted in plant food to produce other crops.

The soils mentioned above have become exhausted primarily in nitrogen and humus, as the result of continuous cropping with non-leguminous plants. Some of these soils have sufficient phosphorous and potassium for fair crop production, although this supply may be in such a condition that it will not become available fast enough to supply the needs of most crops. Sweet Clover, like all legumes, has the power to extract nitrogen from the atmosphere, and on account of its extensive root system is able to obtain phosphorous and potassium from a larger area than most plants. The large



roots not only add a quantity of humus and nitrogen to the soil, but they also open it up to a considerable depth, thus providing better aeration and improving its physical condition. Improved physical condition causes the soil bacteria to increase, and thereby indirectly causes a larger quantity of unavailable phosphorous and potassium to be made available for plant use. On soils which are known to be low in phosphorous or potassium, an application of fertilizer containing the necessary elements should be made when Sweet Clover is sown without a cover crop. However, when it is sown with a cover crop, or in the late Summer or early Autumn on grain stubble, the residues left in the soil from fertilizers applied to the cover crop will, under ordinary conditions, be sufficient for the plants.

Sweet Clover never damages cultivated crops.

In America, yields of Sweet Clover hay have been increased as much as two tons per acre by applications of barnyard manure, and such an increase would approximately equal eight tons of green manure. Some agriculturists may consider it poor farm practice to apply manure to such crops as Sweet Clover, but the beneficial results by increasing the yields of succeeding crops will more than compensate, especially on soils low in organic matter. Heavy applications of manure to the preceding crop also greatly benefits Sweet Clover.

In respect of fertilizers, Mr. A. Somerlad, Tenterfield, N.S.W., who has successfully grown Sweet Clover (*Melilotus Alba*) for over 16 years, states—

"I find potash more essential than phosphoric acid (superphosphate). All clayey soils are rich in potash and this accounts for the plant growing so successfully on raw clay."

TIME OF SOWING.

The proper time to sow Sweet Clover seed must be determined by the climatic conditions of the district, and the state of the seed bed at time of sowing. When growing under natural conditions, self-sown seed that has lain in the ground throughout the Winter germinates sufficiently during the following Spring to produce a good stand. It must not be assumed, however, that since the seed has passed the Winter on or in the ground and has produced a good stand the following Spring, Sweet Clover may be sown at any time of the year and satisfactory results obtained. An enormous number of seeds are shattered from a single plant and fall on a very small area, and possibly only a very small percentage may germinate and then prove more than sufficient.

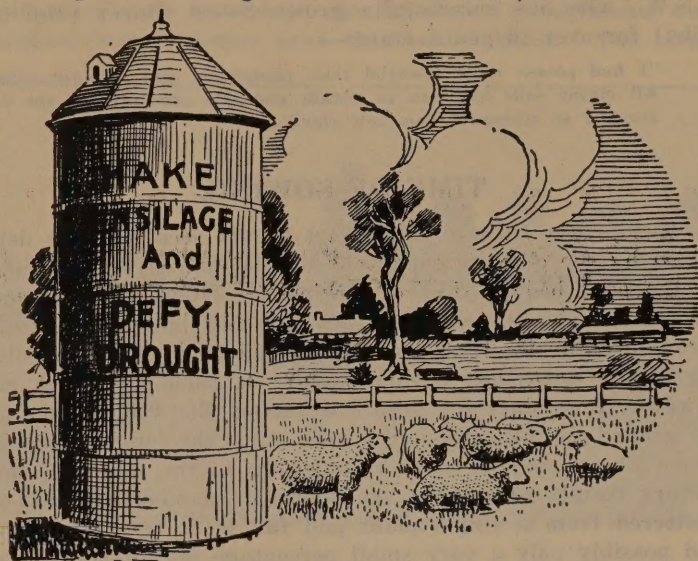
Little is thought of the enormous number of seeds which shatter from a single plant and fall on an area not exceeding 5 or 6 feet in diameter.

Single plants have produced as many as 350,000 seeds, (the approximate number in $1\frac{1}{2}$ lbs.) or about 10,000 seeds to each square foot of ground covered. Conditions are very different when Sweet Clover is sown on cultivated soil at the rate of from 10 to 20 lbs. of seed per acre, and from 50 to 100 seeds to the square foot, and when this quantity is sown it is necessary that it be planted at such a time that the greatest number of seeds germinate and produce plants. In this respect, the times of sowing for Lucerne will apply equally for the same district

Sweet Clover can be sown both in Spring and Autumn.

SWEET CLOVER

to Sweet Clover. In the Murrumbidgee Irrigation Areas of N.S.W., the Northern areas of Victoria, embracing Mildura, the Mallee generally, Rochester and Bamawm areas and the Goulburn Valley, and in the Murray districts of South Australia, embracing Berri, Waikerie, Renmark, etc., where dry Summers and mild Winters are the usual conditions ruling, Autumn seeding would be most suitable, or the seed could be sown in the late Winter so as to get it established as early as possible before the dry weather comes in. In the Western district and the North-eastern areas of Victoria, throughout Gippsland, and in such places as King and Flinders Islands, the North West



coast and other parts of Tasmania, late Winter or early Spring sowing would be the most satisfactory, although in the more southerly parts of Tasmania late Spring would be the most suitable time.

In this respect, Mr. Somerlad writes—

"I quite recognise the necessity for Autumn sowing in some localities, but where sufficient moisture can be relied on, very early Spring sowing has several advantages.

- (1) The plants will not seed the following Autumn, consequently fewer plants will die during the succeeding Winter, and in addition the vigour of the plant will be much hardier and their life prolonged.
- (2) Where rabbits are plentiful, they are apt to give trouble with the young plants in Winter, but do not trouble them in the Spring."

Mr. Somerlad's remarks are based on sixteen years' prac-

Make Sweet Clover into ensilage and insure against drought.

AND ITS UTILITY

tical experience with Sweet or Bokhara Clover in the Northern part of New South Wales.

METHOD OF SEEDING.

The methods used for seeding Red Clover, Berseem or Lucerne, in any dry district will be equally suitable for seeding Sweet Clover. Good results have been obtained in America by merely broadcasting the seed on Winter grain in the Spring when the ground is in a honeycombed condition; the best method is to wait until the ground can be worked, as recommended under the heading, "Preparation of Soil," and then to broadcast and cover the seed with a harrow or to sow it with a drill. Seeds of all kinds usually germinate better when sown the right depth, and small seeds, such as Sweet Clover, Lucerne, Berseem, and most grass seeds only require to be covered lightly. For late Spring, Summer and Autumn sowing of Sweet Clover it is always best to cover the seed, and the depth of covering should vary with the kind of soil, its mechanical condition and the amount of moisture present. In rather heavy soils with a heavy pulverised surface, half an inch will be deep enough, but in a coarse seed bed with dry sandy soil and under dry conditions, the seed must be covered one inch or more. When the seed has been covered, a rolling will smooth and firm the surface of the soil, so as to facilitate germination by bringing the soil particles in closer contact with the seed, and bringing the moisture up from the subsoil by capillarity. **This rolling after seeding is imperative.** When Sweet Clover is sown in the Spring with grain, or when it is sown with a cover crop, it may be drilled in or sown broadcast and covered with a harrow. Better stands are usually obtained however, with a smaller quantity of seed sown with a drill, than when a large amount is broadcasted on honeycombed ground. When the seed is sown, either alone or with grain, a grass seeder attachment to the drill is commonly utilized, and the manure box may then be employed for inoculated soil when this is used. Drop the seed on top of the ground, the hoes throw some soil on it and the rolling completes a perfect job. Sweet Clover may be mixed with some inert substance of approximately the same size and weight and sown with an ordinary grain drill; finely cracked corn, cracked wheat, or coarse bran are often used in America for this purpose. Mix one part Sweet Clover to two parts of any of these substances and set the drill to sow $\frac{1}{2}$ bushel wheat, when it will be found that from 15 to 20 lbs. Sweet

The ground must be thoroughly rolled after seeding
Sweet Clover.

Clover seed is being sown per acre. It must be understood, however, that the quantity will vary with the different types of seed drills, and it is necessary for the agriculturist to make his own experiments. The drill may be tested by blocking it up so that the geared wheel is off the ground and this wheel may be turned a sufficient number of times to equal a definite portion of an acre. The seed run through can then be weighed, and the weight per acre worked out. When it is desired to sow Sweet Clover on land that cannot be cultivated, unscarified seed that contains a large percentage of hard seed should be used, and the seed broadcasted during the Winter; frosts and abundant moisture will penetrate the hard covering of the seed and cause germination. In the colder parts of Australia, such as Tasmania, this broadcasting system should be found very satisfactory in getting a good stand, particularly where the ground is covered with snow, as the freezing and subsequent thawing covers many of the seeds and the result will be seen in the early Spring when growth begins once again.

INOCULATION.

It has been stated by the United States Department of Agriculture that the lack of inoculation is the cause of more failures with Sweet Clover than any other cause, excepting perhaps soil acidity, as when Sweet Clover plants are not inoculated they must depend on the available nitrogen in the soil for their supplies, and as the crop is grown for the most part on soil light in nitrogen, plants cannot be expected to make more than a small growth. Mr. Somerlad, of Tenterfield, New South Wales, who has had 16 years practical experience of Sweet or Bokhara Clover states—"I do not consider inoculation necessary on the majority of soils, although it would undoubtedly pay if the soil were devoid of the necessary bacteria, but I fail to distinguish any difference between Sweet Clover that has been inoculated, either by the glue method, the pure culture (bacteria), or by the earth transfer method, and Sweet Clover sown on ground that has not been inoculated in any manner whatever. I have used all these methods, leaving check areas and although I have watched the matter very closely, I have come to the conclusion that the majority of soils do not require inoculation. I would only inoculate if I thought the soil was sterile. I like the glue method better than either of the others, and this way is the cheapest and absolutely reliable, if

**Do not allow Sweet Clover to grow too long and become woody.
Keep it grazed.**

necessary at all. I don't like the cultures as they are not consistent."

This coincides with our opinion, that inoculation depends on the constitution of the ground, and where there is a fair amount of humus present probably this process could be done without. There are several methods of inoculating Sweet Clover, the principal of which are the Glue Method, Soil Transfer Method, the Pure Culture Method. The Glue Method is as follows:—The Sweet Clover seed is first moistened with a weak solution of glue and water and well inoculated soil is then sifted over the seed, or a little gum can be added to thoroughly inoculated soil from an old Sweet Clover or Lucerne field, and the seed rubbed in this soil. The necessary bacteria cling to the seed by means of the gummy particles of soil and are sown with the seed.

The Soil Transfer Method of inoculation, consists in scattering over the field to be seeded, from 200 to 400 lbs. per acre of soil collected from Sweet Clover, Lucerne, or Burr Clover fields, where healthy plants show an abundance of nodules on the roots. This soil should be scattered on a cloudy day or in the early morning or evening, and immediately harrowed or distributed in the ground, as the sun's rays are very injurious to the inoculation germs. It is a good plan for the person scattering the soil to walk directly in front of the harrow, as if this practice is followed little harm will be done by the light. To facilitate even scattering, the soil may be mixed thoroughly with two or three times its weight of other soil, preferably from the field where the seed is to be sown. It is not essential to scatter the soil for inoculating Sweet Clover just previous to sowing the seed, and it will be just as effective scattered a few months, or even a year before the seed is sown. Generally speaking, where Sweet Clover is to be seeded in the Spring on Winter grain, the soil for inoculation should be applied before the grain is sown. Soil containing the inoculation germ may be dried in a dark place, sifted and run through the fertilizer compartment of the grain drill, and when this method is employed less soil is necessary than when scattered broadcast.

The Pure Culture method is much more simple, as the proper kind of bacteria is now put up by certain chemists in bottles in convenient form for handling, and can be applied to the seeds in such a way that they will be all moist and can

When it is not convenient to graze Sweet Clover, cut the crop for hay or ensilage.

SWEET CLOVER

then be dried in a shed or dark place. Planting should be done as soon as possible after drying. Inoculation by this method should be made the day the seed is sown, and inoculated seed should never be dried in the sun.

RATE OF SEEDING.

The amount of seed of Sweet Clover necessary to sow an acre, depends on the germination of the seed, condition of seed bed, climatic conditions, and method of seeding. In this booklet we are dealing all through with healthy, scarified seed of



Sweet or Bokhara Clover, of good, strong growth (at least 80 per cent.). When broadcasted, 12 to 15 lbs. per acre is ample where the seed bed is in good condition, and an experienced sower will find a good stand can be obtained by sowing even the smaller quantity of 10 lbs. per acre broadcast. The average broadcasting sowing in America is from 15 to 20 lbs. per acre. Where Sweet Clover is grown under irrigation, from 8 to 10 lbs. per acre is sufficient, and when sown in drills from 6 inches to 12 inches apart, 4 to 5 lbs. per acre will suffice. As the Sweet Clover plant grows much larger than Lucerne, it is not necessary they should stand so thick on the ground, as when the stand is too heavy the plants will

Do not make the mistake of seeding Sweet Clover too thickly.

AND ITS UTILITY

not make a normal development, and the crowding will trim the leaves and fine branches from the lower parts of the stems, resulting in a smaller quantity and inferior quality of hay. For a first stand, one or two plants per sq. yard would, perhaps be better, and 2 or 3 lbs. of seed per acre evenly sown would give more satisfactory results, as until the land became thoroughly inoculated by the actual growing of the plant, it would have to depend upon the available nitrogen in the soil for its existence, and would naturally do its work better under adverse conditions if given more room, and consequently more soil to draw on for this necessary property.

USE OF A COVER CROP.

In some instances, a cover crop is an important item in securing a successful stand with Sweet Clover. A cover crop could be used, but is not desirable in warmer districts, but in the Southern parts of Victoria and throughout Tasmania, it is to be recommended, and in certain States of America with similar climatic conditions, good success has been obtained by sowing Sweet Clover in the Spring on Winter grain, or with Spring grain on soil that has been inoculated and was not acid. Seed may be broadcasted in the early Spring on Winter grain when the ground is in a honeycombed condition, or it may be sown later when the ground is cultivated. It has been proved in the colder States of America, that early varieties of Oats and Spring Wheat are most successful as a cover crop for Sweet Clover. Barley is also used for this purpose, and in some instances Flax has been tried, and it was noted that where Flax was used it has been consistently successful. The only difficulty in this respect is, that Sweet Clover may make a growth sufficiently large to interfere seriously with harvesting the Flax, and this condition should be tested thoroughly in an experimental way before being tried for general field practice. These remarks are particularly directed to those agriculturists in Gippsland, who may be tempted by the above remarks to sow Sweet Clover with Flax. In those parts of Australia, where the moisture supply is limited, Sweet Clover should not be sown with a cover crop, and failure to obtain a stand is more likely to occur when the seed is sown with grain, than when sown alone, because the supply of moisture in the soil is apt to be insufficient for both crops and when this condition prevails the Sweet Clover will suffer badly, and in some cases be killed. When Sweet Clover is sown with a cover

A Cover Crop is not necessary for Sweet Clover in most districts.

crop, it is strongly recommended that the grain be seeded at not more than one half the usual rate; this will give the Sweet Clover a much better chance than when a full seeding is made. When severe droughts occur it is necessary to cut the grain for hay if the Sweet Clover is to be saved, and in all cases it is advisable to cut the crop for hay, and to cut as low as possible to give the Sweet Clover the best chance, and to avoid the old grain stubble being in the way of the Clover hay crop when cut later on. We append an extract from a letter from Mr. A. Somerlad, 27/6/1918.—

"Re Cover Crop. Don't touch it in Australia unless you are sure the land contains an abundance of lime, and that the rainfall will be ample. I have failed on fairly good soil with a cover crop of Oats, 18 inches apart in drills, and plenty of rain too, whilst right alongside in poorer land with seed sown on the same day the crop was immense. It might answer in Tasmania and in parts of Victoria, but not as a general rule. You will cut little hay the first year if a cover crop is used, and the stand will also be greatly impaired."

GENERAL TREATMENT OF THE CROP.

The way in which a Sweet Clover field should be handled depends on the time and method of seeding, and the purpose for which it is sown. Climatic conditions must also be taken into consideration, and the handling of the crop governed accordingly. One possible objection to sowing Sweet Clover in the Spring without a cover crop is the weeds, but in spite of this Sweet Clover will stand more adverse conditions than Red Clover or Lucerne, although a heavy growth of weeds will greatly retard the plants, and in some cases kill them out altogether. When Sweet Clover is sown in the Spring without a cover crop, the necessity might arise for continual mowing during the Summer to keep the weeds checked but this can easily be overcome by grazing the field heavily, then removing all stock for about 12 or 14 days, then grazing again heavily, and this system has turned out satisfactorily in New South Wales. During the wet weather it might be necessary to cut the weeds before the plants have become well enough established to turn live stock on the field, but young clover can be safely grazed although the plants should not be allowed to be eaten too closely. When thoroughly established, Sweet Clover may be grazed on throughout the Summer and Autumn. Close feeding generally should be avoided during the Summer, as this retards root development. In the Autumn, this care is not so essential, as Sweet Clover being hardier it is not

Sweet Clover requires proper handling to get the best results; every fodder plant does.

necessary to provide a Winter covering, as in the case, for instance with Red Clover. On account of its value for hay or pasture in the late Summer and Autumn of the year of seeding (Spring seeding) it is strongly recommended that the first year's growth be utilized. In America, it is essential to leave a four or five inch stubble as protection against Winter killing, but this is not at all necessary for the first year's growth in Australia, except perhaps in Tasmania, or the colder parts of Victoria. If the field is not pastured the first season, and the weeds are not troublesome, a cutting of hay may be made when the growth ceases in the late Autumn or early Winter. When Sweet Clover is sown with grain, moisture conditions serve to determine whether the grain is to be permitted to ripen or be cut for hay. One of the special advan-



tages of Sweet Clover is that it produces good pasturage earlier in the season than most forage crops, and in most parts of New South Wales and in the Northern Irrigation areas of Victoria and the Mallee, two cuttings of hay and a seed crop may be harvested. These conditions would also apply to the Mildura and Merbein districts, as well as to the river settlements along the Murray in South Australia (Berri, Renmark, Waikerie, Loxton, etc.). After maturing seed the plants die, but a number will grow quite well for a third year, especially if not allowed to seed too heavily. Sweet Clover may be grazed during the entire second season's growth, providing sufficient stock is kept on the field to prevent the growth be-

Pasturing is an economical way of using Sweet Clover in addition to adding natural manure to the land.

SWEET CLOVER

coming woody. If the plants become coarse, the pasture may be clipped leaving about 8 inches of stubble so as to induce new growth, which will be more palatable. Where it is desired to keep Sweet Clover permanently, the pasture should be allowed to re-seed itself, and stock should be removed at least 8 weeks before frosts are expected so as to give the plants an opportunity of maturing.

UTILITY OF SWEET CLOVER.

Sweet Clover may be utilized for feeding purposes, either as pasture, hay or ensilage, and with the possible exception of Lucerne, when properly handled, Sweet Clover will furnish as much nutritious pasture from early Spring to late Autumn as most leguminous plants, and it has the further advantage that it seldom causes blowing. In addition to the value of Sweet Clover as a fodder, it is one of the best soil improving crops adapted to short rotations which can be grown. When cut for hay, the stubble and roots remain in the soil and when first pastured the uneaten parts of the plants as well as the manure made while the animals are on pasture are added to the soil and benefit the succeeding crops, and in common with all legumes, in addition to humus, Sweet Clover adds nitrogen to the soil. In many parts of America, Sweet Clover is grown solely and wholly to improve the land, and the benefits derived from it when handled in this manner has fully justified its use as the yields of succeeding crops are increased thereby materially. The Yellow Biennial Sweet Clover (*M. officinalis*) as well as the White Sweet or Bokhara Clover, the variety dealt with in this booklet, is an excellent honey plant, and both varieties produce nectar for a very long period. In different parts of the world, Sweet Clover is also used for such additional purposes as a "Pot Herb," human food, as a substitute for vanilla flavoring, in the preparation of medicine and perfume, and the celebrated Gruyere cheese of Switzerland owes its flavor to the Biennial Yellow Sweet Clover (*Melilotus officinalis*).

To summarize, Sweet Clover is valuable to the farmer,—

1. As a pasture plant.
2. As a hay plant.
3. As a honey plant.
4. For growing for ensilage.
5. As a soil improving plant.
6. For plowing under for green manure.

Sweet Clover has a wider range of usefulness than most plants.

AND ITS UTILITY

SWEET CLOVER AT TENTERFIELD, N.S.W.

Experiments by Mr. A. Somerlad.

Marvellous Fodder Plant. Government Experts Enthusiastic.

(From the "Tenterfield Star," December, 1917.)

On Friday, the 30th November, 1917, a most instructive visit was paid to the farm of Mr. A. Somerlad by the members of the Leech's Gully Agricultural Bureau, accompanied by Mr. R. McDiarmid, Inspector of Agriculture, and Mr. E. Breakwell, Agrostologist of the N.S.W. Agricultural Department. The purpose of the visit was the inspection of the Sweet Clover



paddocks, which, in their present condition, repeatedly evoked sentiments of surprising admiration from all the visitors. Mr. Breakwell writes from Sydney Botanic Gardens regarding it as follows:—

"As this clover is practically unknown to Tenterfield pastoralists, a short account of Mr. Somerlad's thorough and practical experiments with it will not be out of place.

"There are three members of this family, viz.—Hexham Scent or King Island Melilot (*Melilotus parviflora*), which is an annual plant with yellow flowers; *Melilotus officinalis*, a biennial (2 years' duration) with yellow flowers; and Sweet

The above illustration is one of Mr. Somerlad's Sweet Clover paddocks.

or Bokhara Clover (*Melilotus alba*), a biennial with white flowers.

"Now, it is something like a matter of 12 years since Mr. Somerlad noticed the promising characteristics of the three above-mentioned plants. He experimented with all of the three, but soon pinned his faith on the white-flowered variety—Sweet or Bokhara Clover. Starting with one or two plants of the latter he carried out feeding experiments and soon became so enthusiastic about the clover that he eventually lost no time in building up a store of seed, sufficiently large to sow a 20 acre paddock. The paddock at the present time is one dense mass of succulent clover, in many places reaching to a height of over 7 feet, and there is not the slightest doubt that nothing like this paddock can be seen in Tenterfield district, whether it be for palatability, for bulk of feed, or for any of those desirable characteristics in a plant essential to the pastoralist or dairyman. What are the characteristics of this Sweet Clover that make it such a valuable plant? In the first place, it is a legume belonging to the same family of plants as the Clovers and Lucernes. In its young stages one would easily mistake it for Lucerne, having the same characteristic color and leaf. Now all legumes possess the property of adding nitrogen and humus to the soil, and Sweet or Bokhara Clover possesses this to a remarkable extent, the nitrogen bacteria nodules being abundant on any plant of the second year's growth. The root system is very extensive, easily extending to a depth of 6 feet. This enables it to open up the soil and render available the plant food stored deep down in the subsoil. A pastoralist might easily ask 'Why grow Sweet Clover instead of Lucerne?' For the simple reason that Sweet Clover will grow on soils where Lucerne could never thrive. A portion of Mr. Somerlad's clover paddock carries very poor soil, yet the clover is as thick here as anywhere else.

"In the second place, Mr. Somerlad has proved that this clover is an excellent pasture plant as far as Tenterfield district is concerned. Stock, both small and large, take to it readily. A little difficulty is encountered when stock are first turned in on the field, as, owing to the presence of a bitter chemical principle in the plant, known as cumarin, a liking for the plant has to be acquired. This does not take long, however, and once acquired it is retained indefinitely, and the plant is then eaten as readily as Lucerne. Under a proper method of management and subdivision, by which too close feeding

This report was written by a Government Expert after a personal inspection.

of the plant can be prevented, Sweet Clover has been shown to carry a beast to the acre from October till the end of May. During the first year, the clover can be grazed in the Spring, when the seed has been sown the previous Autumn.

"The nutritive qualities of Sweet Clover have been proved in America and elsewhere, to be nearly equal to that of Lucerne and much superior to that of Red Clover or Grasses.

"As regards its milk-producing qualities, Mr. Somerlad certifies that his cream goes down almost immediately the cows are taken off the clover and restored when they are put on again. No taint whatever is noticeable in the milk or cream when cattle are grazed on this clover.

It makes excellent hay and is easy to handle. It would probably also make good ensilage, but its best uses are certainly as a pasture plant.

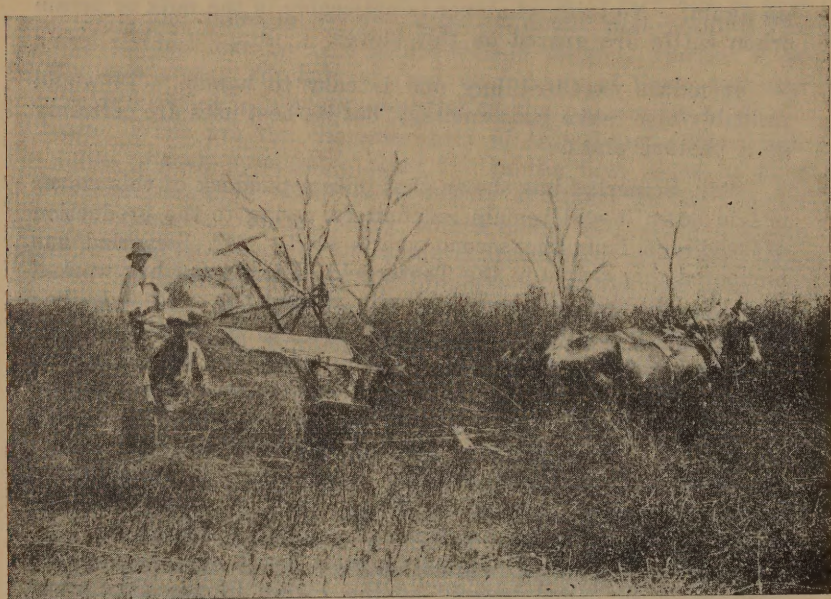
"Mr. Somerlad has shown that once a paddock of this clover is laid down it will remain indefinitely, owing to the production of seedlings from the second year's seed. Mr. Somerlad has pioneered this clover in the Tenterfield district, and has worked continuously and perseveringly with it, and the success he has achieved is not only a credit to himself but to Tenterfield district at large. And it may be truly said that Mr. Somerlad has done his work in the face of much opposition—opposition of a character that would have disheartened a less courageous pastoralist. Many pastoralists and dairymen associate Sweet or Bokhara Clover with Hexham Scent, which is considered a bad weed in some parts of the State. Now opinions concerning the weedy character of the Hexham Scent (*M. Indica*) are controversial, but there is not the slightest doubt that we could do with more so called 'weeds' of the Sweet Clover (*M. Alba*) variety. Thousands of pastoralists, dairymen, and bee-keepers in America are cultivating this plant. After Mr. Somerlad has shown the possibilities of the plant, are his paddocks going to be the only ones of this kind in the Tenterfield district? It is on record that it took the Department of Agriculture in a certain State in America, 12 years to induce neighbouring farmers to grow Lucerne. Now it is grown everywhere throughout the State. Surely Tenterfield farmers will not be as conservative as this. If they inquire into the possibilities of this plant they will probably be induced to take up its cultivation."

What Mr. Breakwell says about Tenterfield farmers applies
equally to Victoria.

SWEET CLOVER

SWEET CLOVER AS A PASTURE CROP.

No other leguminous plant, except perhaps Lucerne, will on fertile soil produce more nutritious pasture from early Spring to late Autumn as Sweet Clover, when it is properly handled. Live Stock, not previously fed on Sweet Clover, may refuse to eat it at first, but this distaste may be easily overcome by turning them on the pasture in the Spring as soon as plants start growth, and generally stock become accustomed to it and will then eat Sweet Clover in preference to other forage plants. It is particularly valuable for poor soils where other crops make but little growth, and the fact that it may be pastured earlier in the Spring than many other plants, and that



it thrives throughout the hot Summer months makes it a valuable addition to the pastures of many farms. Ground that is too rough or too depleted for cultivation or permanent pastures which have become thin and weedy are greatly improved by drilling in after disking, a few pounds of Sweet Clover per acre ; this not only adds considerably to the quality and quantity, but the growth of the grass will be improved by the addition of large quantities of humus and nitrogen to the soil. Where Sweet Clover has been sown two years in succession in separate paddocks, the one sown the first year may be pastured until the middle of the Summer when stock should

Sweet Clover makes equally as good grazing as Lucerne, and is also a splendid milk producer.

AND ITS UTILITY

be turned in on the latter seeding. By handling in this manner excellent grazing is provided throughout the Summer, and a hay or seed crop may be harvested from a field seeded the previous season. The Farmers' Bulletin No. 820 of the United States Department of Agriculture, writes regarding the utilization of Sweet Clover:—

"Some of the best pastures in Iowa consist of a mixture of Kentucky Blue Grass, Timothy, and Sweet Clover. On a farm observed near Delmar, Iowa, stock is pastured on meadows containing this mixture from the first part of April till the middle of June. From this time till the first part of September, stock is kept on one-half or two-thirds the total pasture acreage. The remainder of the pasture land is permitted to mature a seed crop. After the seed crop is harvested, the stock is again turned in on this acreage where they feed on the grasses and first-year Sweet Clover plants until cold weather. The seed, which shatters when the crop is cut, usually is sufficient to re-seed the pastures. By handling his pastures in this manner the owner of the farm has always an abundance of pasture, and at the same time has obtained each year a crop of two to four bushels of re-cleaned seed to the acre from one-third to one-half of his pasture land. This system has been in operation on one field for twenty years, and not until the last two years has Bluegrass showed a tendency to crowd out the Sweet Clover. It is essential that sufficient stock be kept on the pasture to keep the plants eaten rather closely, so that at all times there will be an abundance of fresh shoots."

Whenever it is intended not to utilize the first crop of the second year for hay or silage it could be put to no better purpose than pasturage, and in fact, as previously mentioned, it is better to graze the fields until the middle of the Summer as this affords one of the most economical and profitable ways of handling the first crop. In addition to its fodder value, grazing the plants induces them to send out many young shoots close to the ground so that when they are permitted to mature seed a much larger number of stalks are formed than would be the case if the plants were cut for hay. And again, a hay crop is likely to be cut so close to the ground that the plants will be killed, whereas little danger of killing plants arises from close pasturing early in the season. This must be carefully guarded against when cutting the second year plants. A good stand of Sweet Clover will produce an abundance of pasture for one or two mature bullocks per acre from early Spring right through to the middle of the Summer. Cattle that are pastured on Sweet Clover alone crave for dry fodder and straw or hay should be present in the meadow at all times or where possible they should be turned in on to the natural grass for about an hour a day. When the stock have been removed from the field it should be gone over with a mower, setting the cutter so as to

For fattening cattle and sheep or for grazing horses a Sweet Clover paddock is a valuable asset.

leave the stubble from 6 inches to 8 inches high which will even up the stand and ensure the plants ripening seed at approximately the same date. This attention is important, if the best results are required. Sweet Clover is an excellent pasture for dairy cattle, and when cows are turned on Sweet Clover from grass pasture the flow of milk is increased and the quality improved. Other conditions being normal, this increase in milk production will continue throughout the Summer, particularly as the plants produce an abundance of green forage during the hot, dry months when grass pastures are unproductive, and if properly handled will carry one milch cow per acre during the Summer months.

Sweet Clover has also been proved to be an excellent grazing crop for pigs and when used for this purpose is generally seeded alone, and pastured off for two seasons. The pigs may be turned on the field the first year, as soon as plants have made a 6 inch growth, and from this time up to late Autumn abundant fodder is produced, as pasturing induces the plant to send out many slender, succulent branches. The second season's grazing may begin as soon as growth starts in the Spring. Should the fields not be closely grazed the second season it is advisable to clip occasionally, leaving an 8 inch stubble so as to produce a more succulent growth. One acre of Sweet Clover pasture will ordinarily support ten to twenty pigs, in addition to furnishing a light cutting of hay. To ensure a maximum result in the growth of the pigs, two lbs. of grain per cwt. of the stock should be fed to them each day. Pigs are very fond of Sweet Clover roots and should be ringed before being turned on the pasture; the tendency to rooting, however, may be generally overcome by adding some protein to the grain ration, and meat meal serves this purpose very well. Experiments carried out by the Iowa Experimental Station, U.S.A., have shown that Sweet Clover will carry more pigs per acre and produce cheaper grain and a greater net profit per acre than either Red Clover or Rape. Experiments of the New Jersey Experimental Station, U.S.A., prove that a mixture of Rape and Sweet Clover makes an exceptionally fine pasture for pigs, and produces more fodder than Lucerne, and was preferred to Lucerne by the pigs. This particular seeding was at the rate of 6 lbs. Dwarf Essex Rape, and 10 lbs. Sweet Clover per acre.

Sheep relish Sweet Clover and gain condition rapidly when

Sweet Clover pasture increases the quantity and quality of milk

pastured on it, but care must be taken to see that the pasture is not overstocked with sheep as they are likely to eat the plants so close to the ground as to kill them. This is particularly the case during the first year before the plants have formed crown buds. Horses do well on Sweet Clover pasture as the high protein contained provides such fine pasturage, and no cases of slobbering have been noted with horses.

THE PALATABILITY OF SWEET CLOVER.

The woody growth of Sweet Clover, as it reaches maturity, and the bitter taste due to cumarin, have been the principal causes for live stock refusing to eat it at first. On this account, many farmers have assumed it to be worthless as a feed. It is a fact that stock seldom eat the hard woody stems of the mature plants, but it is true also that stock eat sparingly of the coarse fibrous growth of such legumes as Red Clover or Lucerne when they have been permitted to mature, and have lost much of their palatability. All kinds of stock will eat green Sweet Clover before it becomes woody, or hay which has been cut at the proper time and well cured, after they have become accustomed to it.

The Farmers' Bulletin No. 320, of the United States Department of Agriculture, quotes—

"Many cases are on record in which cattle have refused Lucerne or Red Clover when Sweet Clover is accessible. Milch cows have been known to refuse a ration of Lucerne hay when given to them for the first time. Western range cattle which have never been fed maize very often refuse to eat maize fodder or even maize for a short time, and instances have come under observation in which they ate the dried husks and left the maize uneaten. When these cattle were turned on green grass the following Spring they browsed on the dead grass of the preceding season's growth, which, presumably, more closely resembled the grass to which they were accustomed."

It is very true that stock that have never been pastured on Sweet Clover or fed on the hay must become accustomed to it before they will eat it, but the fact that Sweet Clover is now being fed to stock in nearly every part of the United States of America indicates that the distaste for it can be easily and successfully overcome. Starting growth earlier in the Spring than other forage plants, the early growth of Sweet Clover possibly contains less cumarin than older plants and stock seldom refuse to eat it at this time. Properly cured Sweet Clover hay is seldom refused by stock. At King Island (Tasmania) the King Island Melilot (*Melilotus Parviflora* or *Indica*)

The Palatability of Sweet Clover has been established
beyond doubt.

SWEET CLOVER

which contains considerably more cumarin than Sweet or Bokhara Clover, and which is a much inferior fodder plant, is pastured heavily.

Mr. R. W. McDiarmid, Assistant Inspector of Department of Agriculture, N.S.W., is quoted in the Agricultural Gazette of New South Wales, October 1917, as stating—

"There is at Tenterfield a dairyman, Mr. A. Somerlad, of Hillcrest Farm, Tenterfield, New South Wales, who grows a large area of this Clover with great success. This gentleman writes:—'Yes, I have now had a fair experience with Sweet Clover, as it is 16 or 17 years since it first came to light on father's farm as a volunteer plant, and it was as a result of this experience that I decided to help it along by planting seed from that farm.'

Mr. Somerlad then goes on to say,—'It is easily the best all-round Clover, will stand greater extremes of temperature, and give far greater yields than any of this family. It is well liked by stock and



a great milk producer. Some cattle take to it right away, but with others the taste is acquired. As a soil renovator it is without a rival, and it does not blow cattle, at least that is my experience. I never saw any beast refuse well cured Sweet Clover Hay the first time it was given to them. It loses the 'cumarin' when cut for hay, and appears to develop a gummy feel and a very sweet, agreeable smell.'"

SWEET CLOVER FOR HAY.

When cut at the right time and properly cured, Sweet Clover hay is readily eaten by all classes of live stock, and being rich in protein, growing stock gain weight on it quite equal to that gained by those fed on Lucerne. As a milk producer, both for quality and quantity, Sweet Clover hay is quite equal to that of other legumes.

Sweet Clover hay is a first class milk producer.

AND ITS UTILITY

The following reliable analysis submitted by Mr. Somerlad will be interesting and useful for comparison purposes.

Kind of Forage	Water	Ash	Protein	Crude Fibre	Nitrogen Free Extract	Ether Extract (Fat)
Sweet Clover Hay ...	7.7	7.5	13.3	26.9	42.6	2.1
Lucerne Hay ...	8.4	7.4	14.3	25.0	42.7	2.2
Red Clover Hay ...	15.3	6.2	12.3	24.8	38.1	3.3

THE DIGESTIVE NUTRIMENTS IN 100 LBS.

	Dry Matter per 100 lbs.	Protein	Carbo-hydrates	Ether Extract	Value per ton as Feed.
Sweet Clover Hay ...	92.4	9.0	38.1	1.2	£3 17 1
Lucerne Hay ...	91.6	11.0	39.6	1.2	£4 4 2
Red Clover Hay ...	84.7	6.8	35.8	1.7	£2 19 2

Hay cut the first year is fine stemmed and leafy and very much resembles Lucerne in general appearance; the second year it is essential that the hay be cut at the proper time otherwise it will become woody and unpalatable. When sown in Spring without a cover crop, a cutting of hay can be obtained the same Autumn; when seeded with a cover crop the rainfall during late Summer and early Autumn will largely determine whether the plants will make sufficient growth to allow of same. In many parts of Australia, particularly in the Northern Irrigation areas of Victoria and throughout New South Wales, two and at times three cuttings of hay will be obtained during the second year. A yield of Sweet Clover is generally more to the acre than any of the true Clovers (*Trifolii*).

A few remarks from the Farmers' Bulletin No. 820, of the United States Department of Agriculture, will here be of interest—

"When the seed is sown in the Spring in the North without a nurse crop yields of one to three tons of hay of good quality may be expected the following Autumn. The Massachusetts Agricultural Experiment Station obtained 2,700 lbs. of hay per acre in the Autumn

Note the above table showing feeding value of Sweet Clover.

from Spring seeding, while the United States Department of Agriculture obtained 3,000 lbs. of hay per acre in August from May seeding, in Maryland. Yields of one to two tons and occasionally three tons have been obtained in Michigan, Illinois, Iowa, Kansas, the Dakotas and other States. In Illinois, Iowa, and Kansas yields of one to one and a half tons are often obtained after grain harvest, when weather conditions are favorable. The first crop the second season yields one and a half to three tons of hay to the acre in the northern and western sections of the United States. The second crop of the second season will yield from $\frac{3}{4}$ to $1\frac{1}{2}$ tons to the acre, although this crop usually is cut for seed."

TIME TO CUT FOR HAY.

The first season's growth of Sweet Clover does not get coarse and woody, and may therefore be cut at its maximum growth in the Autumn. Where there is a chance of securing more than one crop during the season, the first crop should be cut when the plants are about 20 inches high. The time for making the first cut the second season will vary according to district; it depends on the rainfall, the fertility of the soil, and the climatic conditions generally, but in no case should the plants be permitted to flower or become woody. On fertile soil, well limed, a very rapid growth is made in the Spring, and plants will often run up to 5 feet in height before showing flower buds. Under this condition the first crop should be cut when the plants are not higher than 20 to 24 inches, if the best quality hay is desired and a second cutting be expected.

Sweet Clover does not grow as rapidly on poor as on good soil and in the drier parts of this country, where irrigation is not available, the best results will be obtained by cutting the first crop when the plants are about 20 inches high, and before the flower buds appear.

HOW TO CUT FOR HAY.

When cutting a Sweet Clover crop for hay in the Autumn after Spring seeding, it is unnecessary to leave more than the ordinary stubble, but in Tasmania and Southern Victoria a stubble of 4 to 5 inches high will undoubtedly be of some help in protecting the plants from Winter injury, and while Sweet Clover is considerably more hardy than the Clovers or Lucerne, nevertheless any protection that may be afforded during the cold weather is beneficial. The first crop of the second year comes from the crown buds, the new branches which produce the second crop of the second year come from the buds formed in the axils of the leaves on the lower portions of the stalks which

Keep Sweet Clover cut or grazed and prevent possible woodiness.

constitute the first crop. These branches usually commence growth when the plants are about 20 inches high. In fields where the stand is heavy, and where the lower portions of the plants are densely shaded, these shoots are soon killed from lack of necessary light. The branches which are first to appear and which are first to be killed are those closest to the ground. It is, therefore, very important when cutting this crop to cut the plants high enough from the ground to leave on the stubble a sufficient number of buds and young branches to produce a second crop. The height and thickness of the plants and the height at which the stubble should be cut all play an important part in determining whether the second crop is to be subsequently harvested, and it is very essential to examine the fields carefully before mowing so as to determine the height at which the plants should be cut so as to leave at least one healthy bud or young branch on each stub. More satisfactory results will be obtained from cutting several inches above the young shoots or buds as the stubble may possibly die back an inch or two when the plants are cut during damp or rainy weather. Owing to the variations in growth of Sweet Clover on different kinds of land, and on account of the difference in the thickness of the plants obtained in different fields it is impossible to lay down any hard and fast rule as to the proper height for cutting the first crop.

CURING SWEET CLOVER FOR HAY.

One of the greatest difficulties in curing Sweet Clover is that the plants are generally ready for cutting for hay at a season of the year when weather conditions are likely to be unfavourable for hay making. In many parts of Australia, such as the Northern areas of Victoria, little trouble is likely to be experienced, and the methods in vogue there for curing Lucerne hay will prove equally suitable for Sweet Clover. Sweet Clover, however, is more difficult than Lucerne to cure, as the leaves are apt to shatter before the stems are cured. Every possible means should be employed to save the leaves as these constitute the best part of the hay.

TAINTING MILK AND BUTTER.

Milk may be tainted occasionally when cows are pasturing on Sweet Clover. However, the large majority of farmers who pasture on Sweet Clover on an extensive scale report very little or no trouble. The flavor imparted to milk at times is

Sweet Clover Hay does not taint either milk or butter.

SWEET CLOVER

not disliked by all people, as some state it is agreeable and does not harm the market value of dairy products in the least. This trouble is experienced for the most part in the early Spring. The tainting of milk may be avoided by taking the cows off the pasture two hours before milking and keeping them off until after milking the following morning, or by cutting the Clover green and allowing it to wilt for two or three hours before feeding. Mr. Somerlad, when asked about the tainting of butter and milk by Sweet Clover, said,—

"Have had absolutely no trouble from this source in sixteen years."

There is no trouble whatsoever in this respect with Sweet Clover Hay.



SWEET CLOVER AS A HONEY PLANT.

Sweet or Bokhara Clover is one of the most valuable of honey plants, and particularly useful also as the period of nectar secretion usually follows that of White and Alsike Clover and consequently comes at a time when the swarms are strong enough to get the full benefit of the secretion. The honey from White Sweet Clover is white in color with a slight greenish tint, the flavor is mild and suggestive of vanilla.

The following letter from the Alliance Box Co. Ltd., 1 Mason Street, Dunedin, New Zealand, manufactures of Bee-

Honey from Sweet Clover was at Dunedin, N.Z. recently pronounced to be of the very best grade.

AND ITS UTILITY

hive and Beekeepers' Supplies, will be of interest. This letter is dated 4th July, 1918—

"A small quantity of Sweet or Bokhara Clover came to hand to one of our clients a little while ago, and his report on it as a bee fodder was so good that we have decided to advertise the Clover in our catalogue which we issue August 1st, each season. A sample of honey said to be of pure Sweet or Bokhara Clover was recently exhibited at a Beekeeper's Conference, and it was pronounced by those present to be the finest sample of honey they had ever seen. It is just possible, therefore, that we may have considerable enquiries for this seed."

The characteristic flavor and color of this honey seems to be less marked during the rapid secretion of nectar. In the irrigation areas of the Western parts of the United States, honey from Sweet or Bokhara Clover is often mixed with that from Lucerne. Long before Sweet or Bokhara Clover was recognised as a useful fodder plant, beekeepers looked upon same as a valuable source of nectar, and for many years seed has been sold by dealers in bee-keepers' supplies, and quite recently an Apiarist in Southern Tasmania grew some Sweet or Bokhara Clover for this purpose most successfully.

The Farmers' Bulletin No. 820, of the United States Department of Agriculture on the "Utilization of Sweet Clover." remarks—

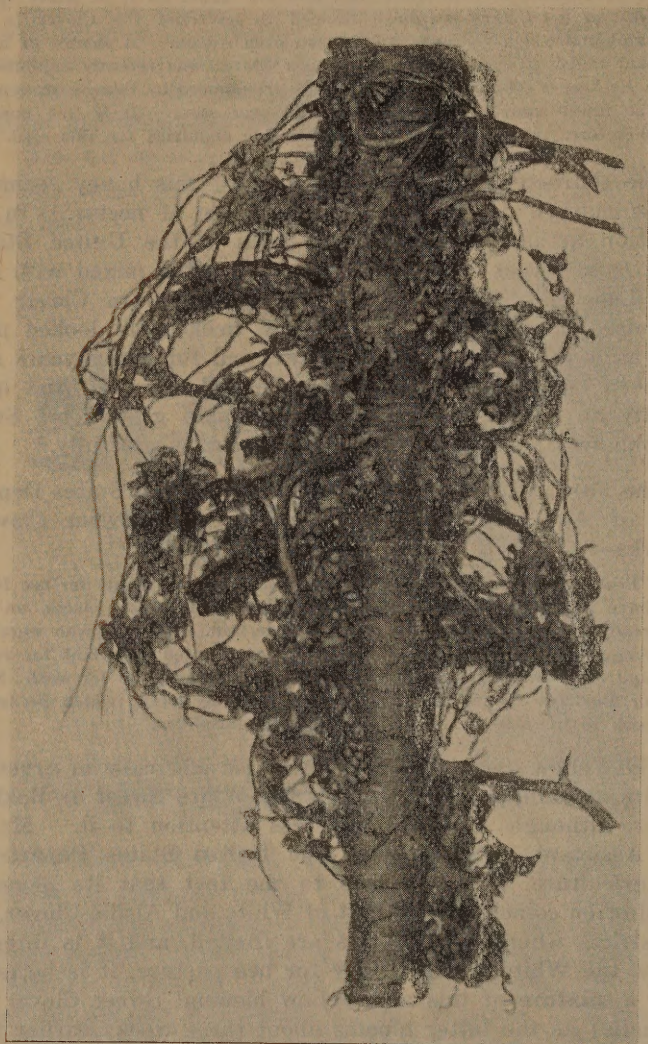
"Beekeepers, who were primarily interested in the plants for bee forage have in the past scattered the seed liberally in waste places, on railroad embankments, and on the roadside, but a number who were also engaged in general farming, have for years used the plant for forage and these were among the earliest to grow the plants for seed. Sweet or Bokhara Clover is to-day almost the only plant which beekeepers seek to increase in waste lands in their localities."

The Yellow biennial Sweet Clover (*M officinalis* or *arvensis*) is quite as valuable for nectar as the White Sweet or Bokhara Clover, although Apiarists pay less attention to it. Mr. H. Coe, Assistant Agronomist of the United States Department of Agriculture attributes this to the fact that its blooming period often coincides with that of White and Alsike Clover, but in districts where these plants are limited, and it is intended to sow the White Sweet Clover for bee pasture, it is better to plant a mixture of this and Yellow biennial Sweet Clover (*M. officinalis*) as the latter blooms about three weeks earlier than the White (*M. Alba*). Wherever Sweet Clover is grown either for fodder or for seed, bee-keeping can be recommended as a valuable source of an additional income, and such locations are especially suitable for extensive commercial bee-keeping.

Beekeepers should grow both the White and Yellow Sweet Clover for honey purposes.

SWEET CLOVER AS A SOIL IMPROVING PLANT.

As already stated, Sweet Clover will make good growth on soils too depleted of humus for profitable crop production, and



in addition to yielding a considerable quantity of forage on such soils it adds a large quantity of humus to them. The big fleshy roots, and the extensive root system of Sweet Clover

Note the bacteria nodules on the Sweet Clover root in the above illustration.

do much towards breaking up the subsoil and providing better aeration and drainage. The effect of this is very often noticeable in the Spring, when land on which Sweet Clover has been grown for some years previously, will be in a condition to plow earlier than adjacent fields where it has not been grown. At a depth of 3 ft., the roots are often one-eighth of an inch in diameter, and they decay in from 5 to 8 weeks after the plant dies. The holes made by the roots are left partly filled with a fibrous substance which permits rapid drainage. Sandy soils are materially benefited by the addition of nitrogen and humus, while hard-pan is often broken up so completely that Lucerne, Clovers and the better pasture grasses will grow rapidly, and prove most productive on such land. The roots add a lot of organic matter to the layers of soil well below the usual depth of plowing, while those in the surface soil, together with the stubble and stems when the crop is plowed under, add more humus than any other legume which may be grown in short rotations. Not only does Sweet Clover add organic matter to the soil, but it has in common with other legumes the power of fixing atmospheric nitrogen by means of the nitrogen gathering bacteria in the nodules at the roots.

The following extracts from the Farmers' Bulletin of U.S. Department of Agriculture, No. 820, are of interest—

"The ability of Sweet Clover to reclaim abandoned run-down land has been demonstrated in Northern Kentucky and in Alabama. In these regions many farms were so depleted in nitrogen and humus by continuous cropping with non-leguminous crops that profitable yields could be obtained no longer. Through the use of this crop many of these farms have been brought back to a fair state of utility. Tests at the Alabama Agricultural Experiment Station show that the increased yield of Maize following Sweet Clover, which had occupied the land for two years, was 6½ bushels per acre."

"Land on which Sweet Clover has been grown for four years at the Ohio Agricultural Experiment Station yielded 26.9 bushels of wheat per acre, as compared with 18.6 bushels on the check plot. Sweet Clover was seeded at the Tennessee Agricultural Experiment Station in the Spring of 1912. One cutting of hay was removed that year, and the following Spring the field was plowed and planted with Maize. The Maize yielded 58.8 bushels per acre as compared with 41.1 bushels per acre for an adjoining plot where Rye corn was turned under. A number of tests have been conducted in South-Eastern Kansas, which shows clearly the value of Sweet Clover as a soil-improving crop for that section. The yield of wheat has been increased as much as 7 bushels per acre, and that of corn as much as 22 bushels per acre by plowing under the second-year growth of the Sweet Clover."

Sweet Clover is extremely valuable as a green manuring crop for plowing under, and it might be suitable for a cover

Sweet Clover will restore land that has been thoroughly depleted of nitrogen.

SWEET CLOVER

crop for the orchard, if sufficient growth were made from seed sown in the Autumn, but as a general rule Sweet Clover (*M. Alba*) would not make sufficient growth before the Spring, and possibly the King Island Melilot (*M. parviflora*) would be more valuable for this purpose, sowing the seed in the Autumn and plowing under in the Spring.

In the Southern States of America, King Island Melilot (*M. parviflora*) is used very largely for this purpose. Sweet or Bokhara Clover used as a cover crop for the orchard would have to be left two years, and as one of the chief essentials of successful fruit growing is to work the orchard thoroughly, lack of cultivation during that period would be extremely detrimental to the trees. It might be possible to cut the Sweet Clover and throw it around the trees as a mulch, but it would be impossible to utilize the plants for hay without causing considerable damage to the fruit trees.

Where soils are low in humus, apart from orchards, nothing better than Sweet or Bokhara Clover can be grown for green manuring purposes, but it must be remembered that the plants will not make their best growth on acid soils, and that it is very essential to provide thorough and proper liming to obtain the best results. Sweet Clover is particularly valuable for improving the soil for Potatoes and root crops, such as Mangels, Beets, Carrots and Parsnips.

SWEET CLOVER IN ROTATIONS.

Sweet Clover being a biennial, is particularly suitable for short rotations, and as mentioned in a previous section, it may be sown in the Spring on Winter grain, or sown with Spring grain similar to Red and Crimson Clover. Planted this way it will produce just as much pasture by the following Autumn as Red Clover, but the ground must be suitable, and sufficient moisture must be available or the young plants are likely to suffer and die out altogether. In some parts of the country a cutting of hay will be possible after the grain has been harvested. Sweet Clover, withstanding drought better than either Red Clover or Lucerne, has a wider range, and on this account its use in rotations may be extended into drier districts. The effects of Sweet Clover on subsequent crops is more marked than the other leguminous plants, and this is particularly true of Maize and Potatoes, so that whenever possible Maize or Potatoes should follow Sweet Clover. Root crops are also

Lime is an essential for the best results from Sweet Clover.

AND ITS UTILITY

benefited by Sweet Clover, the large deep roots of this plant thoroughly opening up the soil. The Sweet Clover roots go deep down after potash, and when the plant dies it leaves considerable quantities of this valuable element in a soluble form near the surface ready for the potatoes or other root crops.

In this respect, it should also be valuable for preceding a crop of Sunflower.

SWEET CLOVER AS A PREDECESSOR TO LUCERNE.

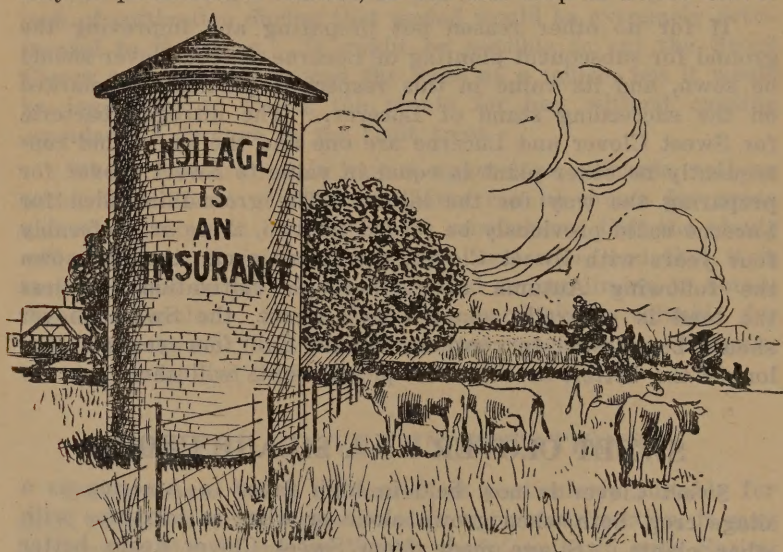
If for no other reason but preparing and improving the ground for subsequent planting of Lucerne, Sweet Clover should be sown, and its value in this respect is particularly marked on the succeeding stand of Lucerne. The nitrogen bacteria for Sweet Clover and Lucerne are one and the same, and consequently no other plant is equal in value to Sweet Clover for preparing the way for the latter. The ground intended for Lucerne could previously be seeded for two, three or preferably four years with Sweet Clover, the Lucerne can then be sown the following Autumn after thorough cultivation. Unless the land is naturally adapted to Lucerne, the Sweet Clover should be allowed to continue for the full four years. The longer the better, as the subsequent results will show.

SWEET CLOVER AS A SILAGE CROP.

Sweet Clover is now held in high favor in America as a silage crop, both when grown alone or when in mixtures with other plants. Silage made from Sweet Clover keeps better than that made from most legumes, as it does not become slimy, as is so often the case with ensilage made from Red Clover or Lucerne, and it produces a valuable feed that contains more protein than well matured maize silage. When the plants make sufficient growth after the grain harvest, where it has been planted with a cover crop, or when seeded alone, it is not necessary to cut for silage until the Autumn, and at this period Sweet Clover may be put into the silo, either alone or in mixture with Maize. First class results have been obtained by placing alternate layers of Maize and Sweet Clover in the silo. When the first crop of the second season is not intended to be grazed, the most economical and profitable way to handle it is to make ensilage, as it is usually necessary to cut

Make Sweet Clover into ensilage and insure against drought.

this crop for hay during a period of the year that the weather conditions, particularly in humid regions, are likely to be unfavorable for hay making, and the large percentage of leaves usually lost in shattering when harvesting the hay will be saved if the crop is run into the silo. The first crop the second season will produce approximately two-thirds as much silage to the acre as Maize, when cut at the time it should be cut for hay, and this is an economical proceeding as the second crop can then be left to be harvested for seed. When handled in this manner where Maize is also grown for silage, at least two-thirds of this which would ordinarily be cut for the silo may be permitted to mature, as the first crop of Sweet Clover



will replace the Maize silage, while the seed crop will generally bring as much per acre as the Maize, and in addition to this the roots and stubble will add large quantities of vegetable matter to the ground. Sometimes Sweet Clover is not cut for silage until in full bloom, and when this is done, from 10 to 12 tons silage per acre will be obtained. It must be remembered, however, that the plants will be killed by the cutting. When the green plants are used for this purpose the crop should be cut with a grain binder which will solve all difficulty of cutting a high stubble, and at the same time bind the plants so that they can be run through the silage cutter without any difficulty. The green plants generally, and especially the first crop of the

Sweet Clover silage is extremely palatable and greatly relished by stock.

second season, contain too much moisture to be put into the silo immediately after cutting, and in some cases in America quantities of juice have been pressed out of the bottom of the silo, and as a result the ensilage has settled considerably. This loss may be overcome by allowing the bundles to lay in the field just as they come from the binder, and until the plants have thoroughly wilted. Hay may be placed in the bottom of the silo to absorb some of the juice.

The following remarks from the Farmers' Bulletin No. 820, of the United States Department of Agriculture, are interesting:

"Several silos in Illinois have been filled with Sweet Clover straw. When this is done it is necessary to add sufficient water to moisten the dry stems. These stems become soft in a short time and ensile in good condition. When the seed crop is threshed, with either a grain separator or a clover huller, the stems are broken and crushed sufficiently to render it unnecessary to run them through a silage cutter. Care must be taken when ensiling the straw to add sufficient water if moulding is to be avoided. It will probably be necessary to add water at the blower and also at the top of the silo. It is essential to tramp the straw thoroughly so as to exclude as much air as possible. After the silo is filled it should be covered with a layer of green plants and thoroughly soaked with water."

SWEET CLOVER IN MIXTURES.

It is found advisable in many instances to sow Sweet Clover and Grasses together for pasture, as the Clover has the power to provide the nitrogen which is used by the Grasses as plant food, and in many cases the mixture will afford more and better grazing, and at the same time, be safer for cattle than other Clovers, such as Red Clover only, as the Clovers will then be less liable to cause bloating. **There is no fear of this whatsoever with Sweet Clover.** A mixture of Grasses and Sweet Clover also forms a dense sod which chokes out the weeds and holds moisture in the soil, and a mixture of this description may be used together for pastures to good advantage, thus utilizing the low, the wet, and the shady places as well as the thinner, poorer parts in the uplands as varieties best adapted can then be included in the mixture. Sweet Clover is often sown in mixtures the Grasses usually used for this purpose being Perennial Rye Grass, Kentucky Blue Grass, Timothy and Italian Rye Grass. In thin poor soils, and those lacking in lime, Cocksfoot and Creeping Bent or Fiorin might well be substituted for Kentucky Blue Grass. Many suitable mixtures could be given, but space will not permit further enumeration of the many good forage plants that could be used to advantage with Sweet

Rye Grass and Sweet Clover grow well together, and make a splendidly balanced ration.

SWEET CLOVER

Clover for pasture. Except in special cases, however, it will be found more advantageous to sow Sweet Clover by itself. Sweet Clover, in Australia, is generally grown alone, and the mixtures quoted below are those mostly used in America. One authority suggests the following:—

Good Soils.—5 lbs. Timothy, 5 lbs. Sweet Clover, 10 lbs. Meadow Fescue.

Medium Soils.—5 lbs. Timothy, 3 lbs. Creeping Bent, 7 lbs. Sweet Clover.

Wet or Acid Soils.—8 lbs. Cocksfoot, 5 lbs. Sweet Clover, 3 lbs. Creeping Bent, 2 lbs. Alsike.

Experience will doubtless show in many parts of Australia, Ryegrass can be substituted to advantage for some of the other grasses shown above. Mr. Sommerlad, of Tenterfield, has proved a mixture of Perennial Rye Grass and Sweet Clover to be most suitable for grazing, and as these plants do well together and form a perfectly balanced ration, it will probably be unnecessary to look further for a good mixture for this country.

SWEET CLOVER AS A SEED CROP.

THE CROP TO HARVEST FOR SEED

Sweet Clover is harvested for seed the year after seeding in districts where this plant will yield two cuttings the second year. It is optional whether the first or second cutting is harvested for seed, but as the plants die when mature, only the seed cutting will be obtained if the first crop is permitted to ripen, and the most economical method is to use the first crop of the second season for pasture, ensilage, or hay and the second for seed. The second crop of the second year seldom grows more than four feet high, when the first crop is pastured or cut, but this shorter growth is very desirable as it allows the plants to be cut with a grain binder without difficulty, and when the first crop of the second year is allowed to mature for seed the plants then make such large growth that it is extremely difficult to handle them with ordinary farm machinery.

TIME TO CUT FOR SEED.

Sweet Clover seed ripens irregularly, and shatters badly when mature, and for this reason a large quantity of seed is

Sweet Clover is a good proposition as a seed crop.

AND ITS UTILITY

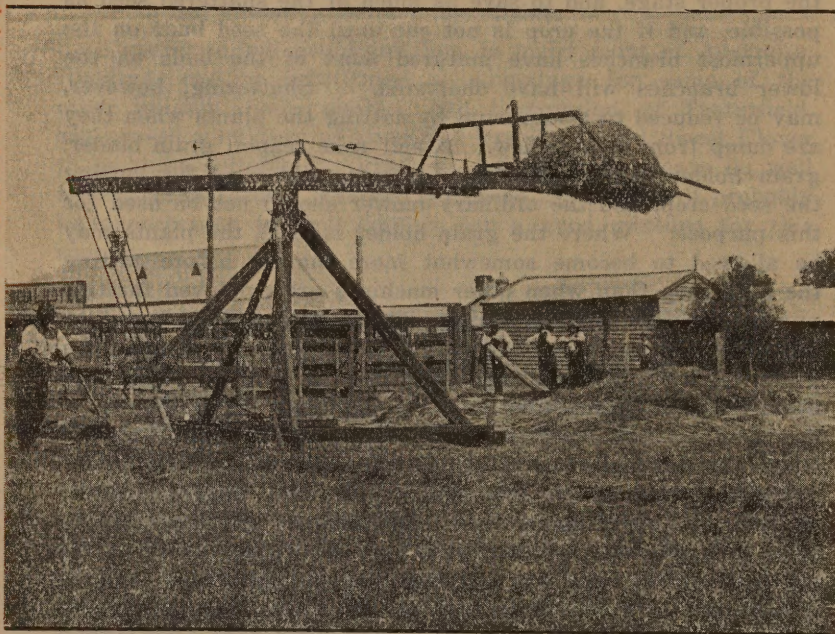
lost, both before and during harvesting, and ordinary harvesting machinery has not been entirely satisfactory for handling the crop. Opinions differ as to the proper stage at which to cut the seed crop; the time for cutting for seed, however, is governed largely by the machinery which is to be used, but the most satisfactory period is when about three-quarters of the seed buds have turned dark brown to black, although at this time some flowers and many immature buds will be found on the plants. The seed will then have a brownish appearance. Owing to the fact that Sweet Clover buds shatter badly when mature, every precaution should be taken to cut the plants at the proper stage, and to save as much of the shattered seed as possible, and if the crop is not cut until the seed buds on the uppermost branches have matured most of the buds on the lower branches will have shattered. Shattering, however, may be reduced to a minimum by cutting the plants when they are damp from rain or dew. A self rake reaper, grain binder, grain holder or corn harvester is generally used for cutting the seed crop, and the ordinary mower should not be used for this purpose. Where the grain holder is used, the plants may be allowed to become somewhat more mature before cutting the seed crop than when other machines are employed for this purpose. More seed is shattered when the plants are cut at the more mature stage, but this is not necessarily lost, as the grain holder is most likely to be used in districts where the shattered seed is depended on for re-seeding. Anything from one fifth to three-quarters of the total seed yield of Sweet Clover is lost from shattering, and the percentage of loss before harvesting depends on when the crop is cut. Even the delay of a few days will make a very considerable difference, and in some instances in America, fields have been observed where 90 per cent. of the seed was lost through shattering in less than a fortnight after the time the plants should have been cut. This loss depends on the way the crop is handled, and the binder or holder may be equipped at a very small cost, so that a considerable quantity of the seed which ordinarily is lost while cutting may be saved. Much shattered seed may be saved by using waggons with tight platforms or platforms covered with canvas. All unnecessary handling should be avoided. To reduce shattering, the crop may be cut in the early morning or late evening while the dew is on the plants, but this procedure could only apply to small acreages, as it is essential to cut the crop as soon as possible after it reaches the proper stage of harvesting; it is, however, a good practice when possible to

Use the second crop of the second season for seed.

cut Sweet Clover for seed at night as the plants are usually damp at that time.

STACKING A SWEET CLOVER SEED CROP.

Unless the seed heads are thoroughly dry, it is inadvisable to attempt threshing, as the seed is then likely to heat, and thus become spoiled, and in any case it is a good plan to stack the plants for at least a fortnight. Generally it is necessary to stack the plants for five or six weeks, building the stooks in some way close to the ground, and when properly built it will be found that they will shed water as well as grain stooks.



A covering should be provided, and where canvas is not available, a top dressing of green grass or young Sweet Clover plants would do very well. When well stacked, rain will not do much harm, though of course it is very much better without it, but it is essential that the plants be given an opportunity of sweating thoroughly before threshing. Stooks should always be built on high ground where water will not be lying about the base, and a foundation of some posts or rails should be provided so as to ensure a good circulation of air beneath the stooks.

Sweet Clover must be thoroughly dried after cutting before threshing for seed.

THRESHING THE SEED CROP.

Two methods are in general use for threshing the Sweet Clover seed crop, and seed may be either flailed from the plants or removed by a grain separator or a clover huller. Flailing is rather a slow method, and does not hold the seed, and is practicable, therefore, only when the necessary machinery for hulling the seed is not available, or where only a very limited acreage is to be threshed. One method of flailing is to place a frame on a hay rack, cover this with half-inch galvanised wire netting, the wire netting being spread very tightly so as to spring the frame. The frame must be sufficiently strong to support the weight of the person who is to do the flailing, and a waggon so equipped may be pulled from pile to pile or along the windrows, and the plants thrown on the frame to be flailed by the person or persons standing on it. After the seed is removed from the plants the hay may be scattered easily and quickly over the ground for soil improvement. As the decaying roots contain an abundance of organic matter, the straw could be thrown off into piles, burnt, and the ashes spread. Flailed seed requires to be thoroughly cleaned with sieves to remove the inert matter and immature buds. This seed should, wherever possible, be run through a hulling and scarifying machine to hull and scarify the seed, as by the latter process the hard outer coat of the seed is scratched or broken, and the percentage of germination is greatly increased, owing to the entrance of moisture being very much facilitated.

The Grain separator is the most satisfactory method of handling a large quantity of Sweet Clover, and when carefully operated, no difficulty will be experienced in removing the seed from the plants. If the seed is to be hulled, however, it is necessary to make certain adjustments, which will vary with the make of the machine and the dryness of the crops. The screens must be adjusted or changed so that they will handle Sweet Clover seed properly; a screen suitable for Lucerne, Red Clover or Burr Clover will answer this purpose splendidly, but the speed of the fans should be decreased so that the seed will not be blown over and about. Half the speed necessary for threshing grain fills the bill for Sweet Clover. A full set of concave teeth should be used to thoroughly hull the seed, and this should be used by running close to the cylinder teeth as is the custom with threshing grain. Where corrugated teeth are available, two rows of the smooth concave teeth should be replaced with these, as the corrugated teeth will greatly facili-

The second crop of the second year is the best to cut for seed.

SWEET CLOVER

tate the hulling of the seed, but to obtain the maximum results in this direction, the plants must be thoroughly dry. Clogging may be overcome by feeding the bundles to the machine slowly, and this detail is very essential if the seed is to be removed properly and fully hulled. Sweet Clover can be run through the threshing machine with the concave teeth merely to separate the seeds from the plants, and the seed which would then be unhulled could be run through a special clover hulling machine; this method, however, calls for much extra time and labour, and should be avoided wherever possible.

YIELDS OF SWEET CLOVER SEED.

Many factors besides shattering determine the yield of Sweet Clover seed, and as only those portions of the plant exposed directly to the sunlight set seed abundantly, a thin stand will produce more seed to the acre than a thick one. When very heavy stands make a large growth, the seed is only produced on the upper part of the plants, whereas, with thinner stands, seed is produced on the lower branches as well. The quantity of moisture absorbed into the soil at the time the seed is maturing is an important factor also, and during the dry hot weather, plants may not be able to absorb sufficient moisture from the soil to supply the excess required by them for seed production, in which case many of the seed buds will fall when only partially matured. When such conditions prevail, the second growth of the second year will produce heavier yields than the first crop. This is due, for the most part, to the inability of the large plants to obtain sufficient moisture for seed production, and as the plants of the second crop are much smaller they do not require as much water, as the tentative growth is usually about half as much. It has been said that the first crop of the second year of Sweet Clover will produce more seed to the acre than the second crop; this depends entirely on the thickness of the plant and the weather conditions, as have been shown above. Under Australian conditions it would be more economical to use the second crop of the second year for seed purposes, as the first crop can then be pastured or cut and cured for hay, but even if it were not possible to cure the plants after cutting for hay, it would be much better to cut early even if the Clover was left to lay on the ground as a mulch. Cut or graze the first crop of the second year, and do it early, and the result will be a better crop of better quality seed, harvested with considerably less trouble than if the plants

**Grazing, Hay, Ensilage, Seed ! What more could be desired
from any one plant ?**

AND ITS UTILITY

had been allowed to go without being grazed or cut for hay until late in the season, as the plants of the second growth would be better matured, and the difficulty of handling a large Autumn growth from the first crop would be avoided. Yields of Sweet Clover seed vary considerably according to climatic conditions, and to methods of harvesting, and range from 200 to 600 lbs. per acre.

SWEET CLOVER STRAW.

Sweet Clover straw may be used for soil improving, or as a roughage for stock, and where not needed for feeding, should be turned under as it will add a considerable quantity of nitrogen and humus to the soil. When the seed is flailed from the plants the straw may be easily and quickly spread over the land at the time of flailing, but when a grain separator or clover huller is used for threshing, it will be necessary to haul the straw and scatter it over the field, and when a crop is threshed in this manner it will be so broken and crushed that stock will eat it freely. The straw may be run directly from the threshing machine into the silo, where by adding sufficient water it can be made into good silage.

CONCLUSION.

In conclusion, although there has been wide-spread prejudice against this plant in the past its hardiness, adaptability, persistency and growing power under adverse conditions have been thoroughly established, and in America for several years past the value of Sweet or Bokhara Clover has been fully recognised.

Let it be understood that rich land is not ideal for Sweet or Bokhara Clover. If it is rich enough for Lucerne, then Lucerne is the crop, but there is undoubtedly a place for Sweet Clover, and this plant will fill a very big niche in Agriculture. In spite of any past wrong impressions or misunderstandings, Sweet Clover will become well and favourably regarded for its many excellent virtues, and the popularity of Sweet Clover will be as fully established in Australia as in America, depending only on the time it takes for the plant to become known to the pastoralists and farmers here.

Even the straw from Sweet Clover after threshing for seed has considerable value.

CONCLUSION (contd.)

The plant has manifold good qualities, and its wonderful utility is now fully recognised in the United States of America where Sweet or Bokhara Clover is now second only to Lucerne amongst the leguminous crops of that country. The writer takes this opportunity of thanking Mr. Somerlad, of Hillcrest Farm, Tenterfield, N.S.W., for his kind and courteous assistance which, based as it is on 16 years local practical experience, has been invaluable; the United States Department of Agriculture in general, and Mr. H. S. Coe and Mr. A. J. Pieters, Agronomists to that Department in particular, for the use of several Farmers' Bulletins from which quotations have been made and much knowledge gleaned as well as for other assistance given.

Professor H. D. Hughes, of the Iowa State College, Ames, Iowa; Professor George Roberts, Head of the Agricultural Experiment Station, Lexington, Kentucky, U.S.A.; the International Harvester Co., of New Jersey, Inc.; E. Breakwell, Esq., Agronomist of the N.S.W. Department of Agriculture, and last but not least, the Officers of the Victorian Department of Agriculture, particularly the Editor of the "Victorian Journal of Agriculture" for kind and courteous assistance in many ways.

The writer himself has made several practical experiments with the Melilots which were of assistance in preparing this booklet, and knowing that Sweet or Bokhara Clover is a valuable and useful fodder plant for the greater part of Australia prophesies that in a few years it will be very largely grown throughout the Commonwealth. The life-story of Sweet Clover has now been told, and it now only waits the progressive farmer to take full advantage of this wonderful plant.

Finis.

Sweet Clover must eventually take its place amongst the leading fodder plants suitable for this country.

THE BEST SEEDS are the CHEAPEST

Therefore, use only

Brunning's Tested Seeds

RYEGRASS	COCKSFOOT	TIMOTHY
PRAIRIE	RIB GRASS	FESCUES
FIORIN	WALLABY	KY. BLUE GRASS
PHALARIS	BURNET	PASPALUM
SORGHUM	AMBERCANE	IMPHEE
JAPANESE MILLET		JOHNSON GRASS
SUDAN GRASS	DWARF ESSEX RAPE	
WHITE CLOVER	ALSIKE CLOVER	
COWGRASS	BERSEEM	TREFOIL
SUBTERRANEAN CLOVER		LOTUS MAJOR
SCARLET CLOVER	STRAWBERRY CLOVER	
SWEET CLOVER	BURR CLOVER	
MANGELS	SWEDES	TURNIPS
SILVER BEET	CHOU MOELLIER	
PURE BRED SEED MAIZE and all		
AGRICULTURAL, VEGETABLE AND FLOWER		
SEEDS GENERALLY		

SEED AND HORTICULTURAL MANUAL

Illustrated throughout. _____ Published Annually.
Post Free on Application

Brunning's Standard Quality Lucerne Seed

The acme of perfection in Lucerne Seed.

Germination over 98 per cent. Purity practically 100 per cent.
Free from Dodder and all other noxious weeds. Only packed in
sealed bags, each 28lbs net.

Samples, Prices and Full Information on any
Lines. Post Free on receipt of application

Brunning's Service, Experience and Reputation are at your command

BRUNNINGS

(F. H. BRUNNING PTY. LTD.)

64 Elizabeth Street, Melbourne. (P.O. Box 857)



Wholly set up and printed in Australia by Peacock Bros. Pty. Ltd.
Printing Department